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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/733,740	12/11/2003	Vinod Philip	2003P15291US	8395

7590 10/31/2006

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ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 10/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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OCT 3 1 2006

GROUP 1700

Application Number: 10/733,740
Filing Date: December 11, 2003
Appellant(s): PHILIP ET AL.

John P. Musone
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed September 7, 2006 appealing from the Office action mailed February 28, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is substantially correct. The Examiner notes that as to the composite powder being "unbound"

(discussed as to claims 1, 25 and 26), the Examiner has taken the position that this is new matter -- See **Ground 1** in the *Grounds of Rejection* below).

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

4,450,184	LONGO ET AL	5-1984
2005/0191516	NAGARAJ ET AL	9-2005
3,607,343	LONGO ET AL	9-1971
2003/0027012	SPITSBERG ET AL	2-2003
2002-275615	JAPAN	9-2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Ground 1. Claims 1-4, 6-12, 22, 23, 25 and 26 stand finally rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description

requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1, line 3 and claims 25 and 26 require that the composite powder comprise "an unbound homogeneous mixture" of the listed constituents. Appellant refers to page 4, lines 7-9 of the specification as providing basis for this amendment. The Examiner has reviewed the disclosure as originally filed, including page 4, lines 7-9, but does not find support for the mixture of the powder constituents being "unbound". While page 4, lines 7-9 provides that the constituents are mixed together to form a homogenous mixture prior to spraying, there is no teaching or suggestion that the composite powder is "unbound". According to MPEP 2111.01, words of a claim must be given their plain meaning unless applicant has provided a clear definition in the specification. *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). In this case the term "unbound" has not been used in the as filed disclosure and was not given another definition in the specification, and therefore, the Examiner gives the term "unbound" its plain meaning. Furthermore, according to MPEP 2111.01, the "plain meaning" refers to the ordinary and customary meaning given to the term by those of ordinary skill in the art. Therefore, as the "plain meaning" of the term, the Examiner understands "unbound" to mean "not held in chemical or physical combination" (as defined in Webster's Ninth New Collegiate Dictionary, Merriam-Webster, Inc.

(publishers), 1990). In the present originally filed disclosure, the constituents must be in at least physical combination since a "composite powder" comprising a mixture of the constituents is required to used. Therefore, the constituents are held in chemical or physical combination, and thus are not "unbound". As a result, the claims contain new matter.

Claims 2-4, 6-12, 22 and 23 do not cure the defects of the claims from which they depend.

Ground 2. Claims 5 and 13 stand finally rejected under 35 U.S.C. 103(a) as being unpatentable over Longo et al (US 44501184) (hereinafter Longo '184) in view of Nagaraj et al (US 2005/0191516) (hereinafter Nagaraj '516).

Longo '184 teaches a method of applying a zirconia (zirconium oxide) based thermal barrier coating. *Column 1, lines 40-50, column 2, lines 25-50 and column 3, lines 5-20.* The applied coating can be porous. *Column 1, lines 40-50, column 4, lines 55-60, and column 5, lines 5-10.* The method includes selecting a composite powder comprising a first constituent that can comprise stabilized zirconia particles. *Column 2, lines 25-50, column 3, lines 5-20 and column 4, lines 60-68 (stabilized zirconia can be used).* The powder also can have a second constituent that can comprise a second ceramic material, such as titanium oxide or cerium oxide. *Column 3, lines 5-20 and column 4, lines 60-68 (note that combinations of the listed materials can be used). (It would have been obvious to select materials from the lists provided by Longo '184 to make a composite powder with an expectation of*

desirable coating results, as the selection of such materials is taught by Longo '184). The second ceramic material can have a melting temperature sufficiently low so that the second constituent particles can at least partially melt when applied. *Column 3, lines 5-20 and column 4, lines 60-68 (given the melting temperatures of cerium oxide (1950 degrees C) and titanium oxide (1640 degrees C) these particles would melt under conventional flame spraying conditions required to at least heat soften the zirconia (melting temperature approximately 2700 degrees C), which is taught at column 1, lines 10-15, where it is indicated that flame spray would involve at least "heat softening" of the coating material).* The composite powder can be applied by thermal spraying using a conventional powder-type flame spray equipment (which would be a low velocity oxygen fuel process/LVOF). *Column 2, lines 45-50 and column 1, lines 5-40, as to the term "low velocity oxygen fuel process", this term was not defined in the disclosure as filed, so the Examiner has based her understanding of the term based on the "plain meaning" or ordinary and customary meaning of the term by those of ordinary skill in the art (See MPEP 2111.01), and it is the Examiner's position that as demonstrated by the art in the case, the combustion powder thermal spray process, i.e. the flame spray process, is equated to a "low velocity oxygen fuel process".* The composite powder can also be applied by plasma spraying (another form of thermal spraying). *Column 2, lines 45-50 and column 1, lines 5-30.* The composite spray powder used can also include other ordinary flame spray powders. *Column 5, lines 15-25.*

Longo '184 teaches all the features of these claims except that the LVOF process actually at least partially melts the titanium/cerium oxide particles and the repair of the component while in the machine.

However, Nagaraj '516 teaches that it is well known to need to repair a zirconia based thermal barrier coating. *Paragraphs [0025] and [0032].* Access to a damaged region of a coating on a component in a machine is provided. *Paragraphs [0032] (the part can be in an assembled state) and [0037].* The damaged region is cleaned. *Paragraph [0037] (note the treatment with water, etc.)* Then, a thermal spraying process, plasma spraying, is used to apply repair material to the damaged region without removing the component from the machine. *Paragraphs [0032], [0039], [0040].*

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Longo '184 to at least partially melt the titanium oxide or cerium oxide particles when spraying the composite powder containing zirconia and titanium oxide or cerium oxide with powder flame spraying (LVOF spraying) in order to provide a desirably dense and bonded coating, because Longo '184 teaches that conventional flame spray processes at least heat softens the coating material when spraying, and given the melting temperatures of cerium oxide (1950 degrees C) and titanium oxide (1640 degrees C) these particles would melt under conventional flame spraying conditions required to at least heat soften the zirconia (melting temperature approximately 2700 degrees C) constituent of the composite powder. It would further have been obvious to one of ordinary skill in the art at the time the invention was made

to modify Longo '184 to use the process for on machine repair as suggested by Nagaraj '516, in order to provide a desirable repaired barrier layer, because Longo '184 teaches to provide a thermal barrier layer using stabilized zirconia and other ceramic particles and that multiple materials can be present, and Nagaraj '516 teaches thermal spraying ceramic materials to provide repaired zirconia based thermal barrier coatings without disassembling. It would further have been obvious to use the thermal spraying method of flame spraying (LVOF spraying) as well as plasma spraying to provide the thermal barrier coating with an expectation of desirable coating results, because while Nagaraj '516 teaches plasma spraying, Longo '184 teaches that the specific barrier coating compositions taught by Longo '184 can be provided by either flame or plasma spraying with desirable coating results.

Ground 3. Claims 5 and 13 stand finally rejected under 35 U.S.C. 103(a) as being unpatentable over Longo et al (US 3607343) (hereinafter Longo '343) in view of Nagaraj et al (US 2005/0191516) (hereinafter Nagaraj '516).

Longo '343 teaches a method of applying a zirconia (zirconium oxide) based thermal barrier coating. *Column 3, line 60 through column 4, line 15.* The method includes selecting a composite powder comprising a first constituent that can comprise stabilized zirconia particles. *Column 1, lines 40-52 (see lines 49 and 51 – stabilized or unstabilized zirconia can be used).* The powder also has a second constituent that can comprise a second ceramic material, such as titanium oxide or manganese oxide. *Column 2, lines 5-*

15, 40-50 and 65-75. (It would have been obvious to select materials from the lists provided by Longo '343 to make a composite powder with an expectation of desirable coating results, as the selection of such materials is taught by Longo '343). The second ceramic material has a melting temperature sufficiently low so that the second constituent particles can at least partially melt when applied. *Column 1, lines 10-15, column 2, lines 40-50 and column 3, lines 50-55 (given the melting temperatures of manganese oxide (1705 degrees C) and titanium oxide (1640 degrees C) these particles would melt under conventional flame spraying conditions required to at least heat soften the zirconia (melting temperature approximately 2700 degrees C)).* The composite powder can be applied by a conventional powder-type flame spray equipment (a low velocity oxygen fuel process/LVOF). *Column 3, lines 50-55, as to the term "low velocity oxygen fuel process", this term was not defined in the disclosure as filed, so the Examiner has based her understanding of the term based on the "plain meaning" or ordinary and customary meaning of the term by those of ordinary skill in the art (See MPEP 2111.01), and it is the Examiner's position that as demonstrated by the art in the case, the combustion powder thermal spray process, i.e. the flame spray process, is equated to a "low velocity oxygen fuel process".* The composite powder can also be applied by plasma spraying (another form of thermal spraying). *Column 3, lines 50-55.* The composite spray powder used can also include other conventional flame spray powders. *Column 1, lines 70-75.*

Longo '343 teaches all the features of these claims except that the LVOF process actually at least partially melts the titanium/manganese oxide particles and the repair of the component while in the machine.

However, Nagaraj '516 teaches that it is well known to need to repair a zirconia based thermal barrier coating. *Paragraphs [0025] and [0032].* Access to a damaged region of a coating on a component in a machine is provided. *Paragraphs [0032] (the part can be in an assembled state) and [0037].* The damaged region is cleaned. *Paragraph [0037] (note the treatment with water, etc.)* Then, a thermal spraying process, plasma spraying, is used to apply repair material to the damaged region without removing the component from the machine. *Paragraphs [0032], [0039], [0040].*

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Longo '343 to at least partially melt the titanium oxide or manganese oxide particles when spraying the composite powder containing zirconia and titanium oxide or manganese oxide with powder flame spraying (LVOF spraying) in order to provide a desirably dense and bonded coating, because Longo '343 teaches that conventional flame spray processes at least heat softens the coating material when spraying, and given the melting temperatures of manganese oxide (1705 degrees C) and titanium oxide (1640 degrees C) these particles would melt under conventional flame spraying conditions required to at least heat soften the zirconia (melting temperature approximately 2700 degrees C) constituent of the powder. It would further have been obvious to one of ordinary skill in the art at the time the invention was made to modify Longo '343 to use the process for on machine repair as suggested by Nagaraj '516, in order to provide a desirable repaired barrier layer, because Longo '343 teaches to provide a thermal barrier layer using stabilized zirconia and other ceramic particles and

that multiple materials can be present, and Nagaraj '516 teaches thermal spraying ceramic materials to provide repaired zirconia based thermal barrier coatings without disassembling. It would further have been obvious to use flame spraying (LVOF spraying) as well as plasma spraying to provide the thermal barrier coating with an expectation of desirable coating results, because while Nagaraj '516 teaches plasma spraying, Longo '343 teaches that the specific barrier coating compositions taught by Longo '343 can be provided by either flame or plasma spraying with desirable coating results.

Ground 4. Claims 14-15 and 17-19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Longo '184 in view of Nagaraj '516 <u>or</u> Longo '343 in view of Nagaraj '516 as applied to claims 5 and 13, respectively, above, and further in view of Japan 2002-275615 (hereinafter '615).

Longo '184 in view of Nagaraj '516 <u>or</u> '343 in view of Nagaraj '516 (hereinafter referred to as Longo '184/'343 in view of Nagaraj '516) teaches all the features of these claims except (1) the calcium or strontium titanate (claims 14-15) and (2) the coefficient of thermal expansions (claims 17-19).

However, '615 teaches that a desirable material to be applied by thermal spraying to a substrate to form a thermal barrier coating is calcium titanate ($CaTiO_3$), which can be applied with yttria stabilized zirconia. *See the abstract.*

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Longo '184/'343 in view of Nagaraj '516 to use calcium titanate particles as suggested by '165 with the stabilized zirconia—titanium oxide particles of Longo '184/'343, in order to provide a desirable barrier layer, because Longo '184/'343 in view of Nagaraj '516 teaches to provide a thermal barrier layer using stabilized zirconia and particles that can be titanium oxide and that multiple materials can be present, and '615 teaches the desirability of using stabilized zirconia and to add a form of titanium oxide, calcium titanate, to form thermal barrier coatings. Given the temperature of spraying, the titanate would also partially melt. Furthermore, it would further have been obvious to modify Longo '184/'343 in view of Nagaraj '516 in view of '615 to use strontium titanate with an expectation of providing a desirable thermal barrier coating, because Longo '184/'343 in view of Nagaraj '516 and '615 indicate the desirability of using stabilized zirconia and titanium oxide materials when forming thermal barrier coatings, and it is the Examiner's position that strontium titanate is a well known titanium oxide material. As a result of using the stabilized zirconia and specific titanium oxide materials, the claimed ranges of the coefficients of thermal expansion would be inherently provided as in claims 17-19.

Ground 5. Claims 16 and 20-21 stand finally rejected under 35 U.S.C. 103(a) as being unpatentable over Longo '184 in view of Nagaraj '516 or Longo '343 in view of

Nagaraj '516 as applied to claims 5 and 13, respectively, above, and further in view of Spitsberg et al (US 2003/0027012).

Longo '184 in view of Nagaraj '516 or Longo '343 in view of Nagaraj '516 (hereinafter referred to as Longo '184/'343 in view of Nagaraj '516) teaches all the features of these claims except (1) the sodium-zirconium-phosphate-silicate (claim 16) and (2) the thermal conductivity (claims 20-21).

However, Spitsberg teaches that a desirable material to be applied by thermal spraying to a substrate to form a thermal barrier coating is zirconium phosphate materials (NZP-family materials), including sodium zirconate phosphate, which are applied with yttria stabilized zirconia (YSZ). *Paragraphs [0022] and [0025].*

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Longo '184/'343 in view of Nagaraj '516 to use NZP material particles as suggested by Spitsberg with the stabilized zirconia—titanium oxide particles of Longo '184/'343, in order to provide a desirable barrier layer, because Longo '184/'343 in view of Nagaraj '516 teaches to provide a thermal barrier layer using stabilized zirconia and other ceramic particles and that multiple materials can be present, and Spitsberg teaches the desirability of using stabilized zirconia and a form of NZP materials to form thermal barrier coatings. Given the temperature of spraying, the NZP materials would also at least partially melt. It would further have been obvious to modify Longo '184/'343 in view of Nagaraj '516 in view of Spitsberg to use sodium-zirconium-phosphate-silicate with an expectation of providing a desirable thermal

barrier coating, because Longo '184/'343 in view of Nagaraj '516 and Spitsberg indicate the desirability of using stabilized zirconia and NZP materials, including those with sodium zirconate phosphate when forming thermal barrier coatings, and it is the Examiner's position that sodium-zirconium-phosphate-silicatis a well known NZP material. As a result of using the stabilized zirconia and NZP materials, the claimed ranges of the coefficients of thermal conductivity would be inherently provided as in claims 20-21.

(10) Response to Argument

The Examiner notes that in the Appellants' Arguments section, appellant first provides a summary of their invention in section A, but does not provide any arguments as to the outstanding rejections in this section.

Ground 1. The 35 USC 112 rejection of claims 1-4, 6-12, 22, 23, 25 and 26

Appellant's Arguments

Appellant argues that claims 1, 25 and 26 recite that the composite powder comprises an unbound homogeneous mixture and that the Examiner contends that using the term "unbound" to modify the phrase "homogeneous mixture" is new matter, and cites Webster's dictionary to interpret "unbound" to mean "not held in chemical or physical combination" (and appellant states that they agree with such interpretation). The Examiner then states that "the constituents must be in at least physical

combination." Appellant argues that in the amendment after final they submitted that the Examiner misapplied the definition by reading out the word held. According to appellant, the term "unbound" does not mean that the constituents are not in physical combination (in fact, the powder constituents are in physical combination -i.e. mixed). Rather, the term "unbound" means that the constituents are not "held" in physical combination.

In the Advisory Action, the Examiner responded that "at the very least the formed physical mixture would be "held" in that homogenous state prior to spraying of the composite powder." Applicants respectfully submit that the Examiner is again misapplying her own interpretation of the term "unbound".

The term "unbound" requires more than the constituents being in physical. combination, and further requires that that the constituents are not "held" or positively linked together (whether chemically or physically). For example, simple table salt (sodium chloride) is held or positively linked by chemically binding the constituent sodium and chlorine atoms together. For another example, a simple bound notebook is held or positively linked by physically binding the constituent paper sheets with spiral wire or glue.

Appellants respectfully submit that the specification suitably conveys that the inventors had possession of the mediating term 'unbound'. Page 4, lines 7-9 explains: "The two constituents are mixed together to form a homogenous mixture prior to spraying, such as by ball mixing or by wet chemical mixing." Those skilled in the art

would readily understand that the inventors had possession of the knowledge that the powder constituents can be unbound since ball mixing and wet chemical mixing produces a powder whose constituents are unbound. Moreover, the specification discloses that, after mixing, when the composite powder is sprayed, the lower melting temperature constituent 16 is at least partially melted by the spray process and resolidifies to form splats 26 that surround and encase the particles of the high melting temperature material 14. Page 5 lines 9-17. Thus, appellants unquestionably appreciated that the LVOF process binds the mixed powder into positively linked constituents. The deliberate and intelligent choice to bind the constituents by the LVOF process, in of itself, evidences that appellants appreciated that the constituents are unbound prior to the LVOF process. To require appellants to have explicitly disclosed a negative (i.e. that the mixed constituents are unbound prior to being bound by the LVOF process), as the Examiner seems to be requiring, is well above the written description requirements of Section 112 and therefore impermissible.

The Examiner's Response

The Examiner has reviewed appellant's arguments, however, her position as to the rejection remains. Appellant has agreed with the Examiner's position that the claimed term "unbound" as to the phrase "homogenous mixture" means that the mixture is "not held in chemical or physical combination". The Examiner understands the specification to provide, therefore, that the powder is held in a homogenous "bound" mixture (a physical combination, at least), with no indication that the mixture

can be unbound as claimed. Appellant has argued that the Examiner is incorrect because the mixture would not be "held" in physical combination. According to appellant, "held" apparently means "positively linked", although appellant does not cite a source for this meaning. The Examiner would not understand the term to be so limited. According to MPEP 2111, claims must be given their broadest reasonable interpretation. Furthermore, according to MPEP 2111.01, words of a claim must be given their plain meaning unless applicant has provided a clear definition in the specification. *In re Zletz,* 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). In this case the term "held" has not been used in the as filed disclosure with regard to the term "unbound" (as the term "unbound" was not even used) and thus was not given another definition in the specification. Furthermore, according to MPEP 2111.01, the "plain meaning" refers to the ordinary and customary meaning given to the term by those of ordinary skill in the art. Therefore, as the "plain meaning" of the term, the Examiner understands "held" to also mean "maintained" (see definition 9b of "hold" ("held" is listed as vb form or "hold") as defined in Webster's Ninth New Collegiate Dictionary, Merriam-Webster, Inc. (publishers), 1990).

The disclosure as originally filed clearly provides that the constituents are "held" or "maintained" in a physical mixture prior to flame spraying using the low velocity oxygen fuel gun, with no indication that the constituents are not "held" or "maintained" in the physical mixture. The claims <u>as now filed</u> would require that the constituents are not "held" or "maintained" in the physical mixture. The original

disclosure required providing a "composite powder" that is mixed together to form a homogeneous mixture "prior to spraying" (column 4,lines 7-9 and original claim 1) and then spraying the "composite powder". Thus, the constituents are clearly "maintained" in the form of the mixture prior to spraying. There is simply no indication that the materials are "unbound" as now claimed.

Appellant's arguments as to the meaning of the term "held" and "unbound" are directed to a definition that is more limited than the broad definitions of the term. Furthermore, as to appellant's arguments as to the actions of the constituents during spraying, these actions do not mean that the constituents were "unbound" in the broad sense of the word before spraying, simply that a different bonding occurs during spraying.

Ground 2. The rejection of claims 5 and 13 under 35 USC 103 using Long '184 in view of Nagaraj.

Appellant's Arguments

Appellant argues that Longo '184 teaches an improved abradable coating that uses a ceramic powder with hollow spheres, and discloses that the inventive ceramic powder may comprise one or more of a laundry list of constituents, some of which meet appellant's first constituent claim limitation and some of which meet appellant's second constituent claim limitation. Appellant argues that while the Examiner argues that the constituents that the meet the limitations of the claimed constituents can be found in

this laundry list and that it would be obvious to selectively pick and choose from among this list, appellant disagrees. Appellant argues that Longo '184 does not teach selecting a first constituent comprising stabilized zirconia particles and selecting a second constituent comprising ceramic particles having a melting temperature sufficiently low so as to at least partially melt when applied with a LVOF process, but rather that Longo '184 teaches to select one or more constituents that provide an abradable coating having strong bond strengths and are friable, as well as have relatively high temperature resistance. According to appellant, selecting a constituent having a melting temperature sufficiently low so as to at least partially melt when applied with an LVOF process would not provide the relatively high temperature resistance that Longo '184 seeks, and thus, Longo '184 teaches away from the claimed invention.

Additionally, appellant argues that Longo '184 does not teach using an LVOF process to melt the first and second constituents and that the machine is repaired in situ. While the Examiner has provided Nagaraj as to this issue, appellant argues that one skilled in the art faced with the in situ repair problem that appellant solved would have used the Nagaraj high temperature plasma spraying method rather than the flame spraying method, because Nagaraj's spray process is specifically intended for in situ repairs, whereas the Longo '184 teaching is not intended for in situ repairs.

The Examiner's Response

The Examiner has reviewed appellant's arguments, however, her position as to the rejection remains. Longo '184 teaches that an abradable coating is to be made by flame spraying ceramic hollow sphere particles made by blending powdered raw materials. The use of hollow spheres as the "composite powder" material of the presently claimed invention is not prevented or suggested against by the claims as worded. As to the selection of powdered raw materials to be used, Longo '184 teaches a list of such raw materials to be used, and teaches that combinations of these materials can be used. Moreover, in the examples and the claims, Longo '184 clearly provides that zirconia (zirconium oxide) can desirably be one of the constituents. See column 3, lines 5-35 and claims 1-2. While the second material selected from the list of Longo '184 does not necessarily have to meet the lower melting temperature requirements of the second material of the present claims, Longo '184 does teach specific materials that meet these requirements, such as cerium and titanium oxide, as discussed in the ***Grounds of Rejection*** above. It would have been obvious to one of ordinary skill in the art to select materials to be used from among the list of materials given by Longo '184 because Longo '184 specifically teaches to make such a selection. Although appellant argues that Longo '184 does not teach selecting the first constituent to be comprising stabilized zirconia particles and the second constituent to have a melting temperature sufficiently low so as to partially melt when applied with an LVOF process, it remains the Examiner's position that the selection of materials that provide these features is suggested by Longo '184. While Longo '184 may teach the selection of the materials to

provide a desirable abradable coating, rather than based on relative melting temperature, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Here, appellant has made no showing that unexpected benefits or criticality were provided by selecting the specific materials that meet appellant's claims from the list taught by Longo '184. Appellant merely argues that selecting a constituent having a melting temperature sufficiently low so as to at least partially melt when applied with an LVOF process would not provide the relatively high temperature resistance that Longo '184 seeks, and thus Longo '184 teaches away from the claimed invention. However, Longo '184 specifically provides that the abradable coating to be applied can be made from zirconia and other materials that include cerium oxide and titanium oxide (materials that meet the requirements of the present claims as to melting temperature). There is no indication in Longo '184 that the specific materials taught as providing an acceptable abradable coating cannot, in fact, be used to provide such a desired coating. Moreover, applicant has provided no showing to indicate why these materials would not provide a coating as desired by Longo '184. As discussed in MPEP 2121, Prior Art is presumed to be operable/enabling.

Furthermore, as to Longo '184 not teaching using an LVOF process to melt the first and second constituents, the presently claimed invention requires providing

zirconia particles and a second constituent with a melting temperature "sufficiently low so that the second constituent particles at least partially melt when applied with a low velocity oxygen fuel process" and "using the low velocity oxygen fuel process to apply the composite powder to a surface" (claim 5) or "using the low velocity oxygen fuel process to apply the composite powder to the damaged region" (claim 13). The first and second constituents are therefore not required to be melted. At most, the second constituent is required to be "at least partially melted". Since Longo '184 teaches a flame spraying process, and that in the flame spraying process the particles are either softened or melted (column 1, lines 5-20), and as discussed in the ***Grounds of Rejection*** above, the titanium oxide or cerium oxide particles (the second constituents) will be at least partially melted by the time the zirconia particles (the first constituent) suggested by Longo '184 are softened, Longo '184 provides that the second constituent would be "at least partially melted". As to specifically using a LVOF (low velocity oxygen fuel) process as the spray process, as discussed in the ***Grounds of Rejection*** above, Longo '184 teaches that the particles can be applied using flame spraying and describes conventional combustion powder-type flame spray equipment (column 2, lines 45-50 and column 1, lines 15-40). It remains the Examiner's position that a "low velocity oxygen fuel process" would be a conventional powder type flame spray process. The term "low velocity oxygen fuel process" was not defined in the disclosure as filed, and thus the Examiner has based her understanding of the term based on the "plain meaning" or ordinary and customary meaning of the term as used by those of ordinary

skill in the art (See MPEP 2111.01). It is the Examiner's position that as demonstrated by the art in the case and as discussed in the Final Rejection of February 28, 2006 (paragraph 4), the regular or conventional combustion powder thermal spray process, otherwise known as the flame spray process, is equated to a "low velocity oxygen fuel process", as defined by "Combustion Powder Thermal Spray Process (Flame Spray Process)" document, which was cited by appellant in the Information Disclosure Statement of Dec. 11, 2003 (this is distinguished from the High Velocity Oxygen Fuel Thermal Spray Process (HVOF) process, as noted in the "HVOF High Velocity Oxygen Fuel Thermal Spray Process" document also cited by appellant Dec. 11, 2003). Appellant has provided no evidence or showing to indicate that the term has a different meaning.

As to the repair of the machine in situ (without removing the component to be repaired from the machine), the Examiner has cited Nagaraj as to this issue. Appellant has argued that one skilled in the art faced with the in situ repair problem that appellant solved would have used the Nagaraj high temperature plasma spraying method rather than the flame spraying method, because Nagaraj's spray process is specifically intended for in situ repairs, whereas the Longo '184 teaching is not intended for in situ repairs. The Examiner disagrees. Nagaraj has been cited as to the well known process of repairing a zirconia based thermal barrier coating in situ, without removing the component from the machine. While Nagaraj teaches the use of a plasma thermal spraying process for providing the repair, the primary reference in this case,

Longo '184, teaches that the composite powder provided by Longo '184 can desirably be provided by thermal spray processes of either combustion powder flame spraying or by plasma spraying (column 1, lines 5-40). Since Longo '184 teaches that the particles can be provided by either method and still provide a desirable coating, one of ordinary skill in the art would understand that the desirable repair could be provided by flame spraying with an expectation of desirable application and adherence.

Ground 3. The rejection of claims 5 and 13 under 35 USC 103 using Long '343 in view of Nagaraj.

Appellant's Arguments

Appellant argues that claims 5 and 13 recite using the LVOF process to apply the composite powder, and prior art plasma spray processes are unsuitable for the present invention. According to appellant, Longo '343 is concerned with providing a non-porous flame sprayed coating, with bonding a fluxing ceramic, such as titanium dioxide, to the surface of the powder to be flame sprayed. According to appellant, Longo '343 discloses a conventional high temperature high velocity spray process, in particular explaining in column 1, lines 35-40 that the process can use either a plasma type gun or a power type gun described in USPN 2,961,335, which in turn teaches in column 2, lines 5-6, that the gun is useful for "materials of extremely high melting points" such as zirconia, and further teaches in column 3, lines 29-39, that the gun provides the "conventional high forward linear velocity component" which "may be as

high as the speed of sound". Appellant also notes that column 4, lines 15-26 of Longo '343 discusses the temperature of the substrate, not the temperature of the spray.

Appellant further incorporates the earlier argument regarding the improper combining of Longo '184 and Nagaraj to read on the claimed in situ repaired coating by using an LVOF process. Appellant also notes that dependent claim 23 recites that the thermal barrier coating is porous, while Longo '343 emphasizes that its coating intentionally provides a "substantial reduction in porosity" and may be considered "self-sealed" and "impermeable".

The Examiner's Response

The Examiner has reviewed appellant's arguments, however, her position as to the rejection remains. Longo '343 teaches that a non-porous coating is to be made by flame spraying a powder with a fluxing ceramic bonded to the surface of the powder to be flame sprayed. The use of such a flame spraying powder with the bonded fluxing ceramic or the resulting non-porous coating is not prevented by the claims as presently worded. As to the argument that Longo '343 does not provided the claimed LVOF (low velocity oxy fuel) process, the Examiner disagrees. Longo '343 teaches that the powder made by applied "with any powder-type flame spray equipment, as for example, the powder type gun described in U.S. Pat. No. 2,961,335" (column 1, lines 35-40), and also teaches that "The flame spraying of the powders in accordance with the invention is effected in the conventional manner, using the conventional powder-type flame spray equipment" (column 3, lines 50-55), and further teaches the use of a "conventional

combustion-type powder flame spray gun (METCO ThermoSpray Gun, Type 2P)" (column 5, lines 20-30) in an example. Therefore, the flame spraying taught by Longo '343 is not limited to the use of the exemplary flame spray gun of U.S. Pat. No. 2,961,335, but rather includes the use of "any powder-type flame spray equipment". It remains the Examiner's position that a "low velocity oxygen fuel process" would be a "conventional powder-type flame spray" process. The term "low velocity oxygen fuel process" was not defined in the disclosure as filed, and thus the Examiner has based her understanding of the term based on the "plain meaning" or ordinary and customary meaning of the term as used by those of ordinary skill in the art (See MPEP 2111.01). It is the Examiner's position that as demonstrated by the art in the case and as discussed in the Final Rejection of February 28, 2006 (paragraph 4), the regular or conventional combustion powder thermal spray process, otherwise known as the flame spray process, is equated to a "low velocity oxygen fuel process", as defined by "Combustion Powder Thermal Spray Process (Flame Spray Process)" document, which was cited by appellant in the Information Disclosure Statement of Dec. 11, 2003 (this is distinguished from the High Velocity Oxygen Fuel Thermal Spray Process (HVOF) process, as noted in the "HVOF High Velocity Oxygen Fuel Thermal Spray Process" document also cited by appellant Dec. 11, 2003). Appellant has provided no evidence or showing to indicate that the term has a different meaning. Moreover, while Longo '343 teaches that "any powder-type flame spray equipment" can be used, and U.S. Pat. No. 2,961,335, is merely an example of a conventional powder type flame spray gun to be used, it too

would describe relatively low velocity conventional oxygen fuel flame spraying. At column 3, lines 29-40, it states:

> "The combustible gases emerging from the nozzle have the conventional, high forward linear velocity component as, for example, occurs in torches. The exact value of this forward linear velocity component depends of course upon the particular nozzle construction and on the gas input pressure. The same, however, is generally of an order of magnitude of about 400 ft. per second, with, for example, a gas input pressure of about 15 lbs. per square inch. The same, however, may vary to as low as 200 ft. per second or even lower, and may be as high as the speed of sound."

While 200 ft/sec and 400 ft/sec may be considered "high" velocity in absolute terms, in the field of flame spraying, it is the Examiner's position that these would be considered conventional speeds in the area of flame spraying. Note that 200 ft/sec is described as a relatively "low" speed. Appellant has provided no evidence or showing of what speed would be considered "low" or "high" in the area of flame spraying or "low velocity oxygen fuel spraying", because as discussed above, appellant has provided no definition at all of the term, and thus the Examiner has used the ordinary meaning of the term.

As to appellant noting that column 4, lines 15-26 of Longo '343 discusses the temperature of the substrate, not the temperature of the spray, the Examiner notes the description of heat softening or melting of the coating material at column 1, lines 5-15.

As to the in situ repair (without removing the component to be repaired from the machine), the Examiner has cited Nagaraj as to this issue. Appellant has argued that one skilled in the art faced with the in situ repair problem that appellant solved would

have used the Nagaraj high temperature plasma spraying method rather than the flame spraying method, because Nagaraj's spray process is specifically intended for in situ repairs, whereas the Longo '343 teaching is not intended for in situ repairs. The Examiner disagrees. Nagaraj has been cited as to the well known process of repairing a zirconia based thermal barrier coating in situ, without removing the component from the machine. While Nagaraj teaches the use of a plasma thermal spraying process for providing the repair, the primary reference in this case, to Longo '343, teaches that the composite powder provided by Longo '343 can desirably be provided by thermal spray processes of either combustion powder flame spraying or by plasma spraying (column 1, lines 5-40). Since Longo '343 teaches that the particles can be provided by either method and still provide a desirable coating, one of ordinary skill in the art would understand that the desirable repair could be provided by flame spraying with an expectation of desirable application and adherence.

As to the argument that claim 23 provides a porous coating while Longo '343 does not, the Examiner notes that claim 23 (which depends from claim 1) is not rejected by this combination of art. Claims 5 and 13 have no requirement as to the porosity of the applied coating.

Ground 4. The rejection of claims 14-15 and 17-19 under 35 USC 103

Appellant's Arguments

Appellant argues that dependent claims 14-15 and 17-19 depend from independent claim 13 and are allowable for the reasons claim 13 is allowable.

The Examiner's Response

The Examiner has reviewed appellant's arguments, however, her position as to the rejection remains. The rejection of claim 13 is maintained for the reasons given as to **Grounds 2 and 3** above (see *The Examiner's Response*) and therefore, the rejection of claims 14-15 and 17-19 is maintained as appellant has provided no further arguments as to these claims.

Ground 5. The rejection of claims 16 and 20-21 under 35 USC 103

Appellant's Arguments

Appellant argues that dependent claims 16 and 20-21 depend from independent claim 13 and are allowable for the reasons claim 13 is allowable.

The Examiner's Response

The Examiner has reviewed appellant's arguments, however, her position as to the rejection remains. The rejection of claim 13 is maintained for the reasons given as to **Grounds 2 and 3** above (see *The Examiner's Response*) and therefore, the rejection of claims 16 and 20-21 is maintained as appellant has provided no further arguments as to these claims.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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PRIMARY EXAMINER

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Timothy Meeks, SPE 1762

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